

## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

## [Claim(s)]

[Claim 1] Either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals by the chelating agent, and is obtained is used. A single metal or a compound metal is supported to the porous body which is a detailed grain. Alkali metal, The support approach of the macromolecule chelate metal catalyst characterized by supporting one sort of the element belonging to either alkali metal, alkaline earth metal and rare earth, or two sorts or more using the water solution containing one sort of the compound of the element belonging to either alkaline earth metal and rare earth, or two sorts or more.

[Claim 2] It processes in the water solution containing one sort of the compound of the element which belongs the porous body which is a detailed grain to either alkali metal, alkaline earth metal and rare earth, or two sorts or more. One sort of the element belonging to either alkali metal, alkaline earth metal and rare earth or two sorts or more are supported. By the chelating agent after that The support approach of the macromolecule chelate metal catalyst characterized by supporting a single metal or a compound metal using either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst elements which are obtained by carrying out the chelate bond of one sort of metals, and is obtained.

[Claim 3] Are the approach of supporting a catalyst metal component, and the monolith which carried out the coat of the porous body to the monolith which carried out the coat of the porous body which is a detailed grain by the chelating agent The compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals, and is obtained is used. Support a single metal or a compound metal to a porous body, and one sort or two sorts or more of water solutions of the compound of an element which belong there at either alkali metal, alkaline earth metal and rare earth are added. The support approach to the monolith of the macromolecule chelate metal catalyst characterized by making one sort of the element belonging to either alkali metal, alkaline earth metal and rare earth, or two sorts or more support.

[Claim 4] It is the approach of supporting a catalyst metal component to the monolith which carried out the coat of the porous body which is a detailed grain. One sort or two sorts or more of water solutions of the compound of an element which belong the monolith which carried out the coat of the porous body to either alkali metal, alkaline earth metal and rare earth are used. One sort of the element belonging to either alkali metal, alkaline earth metal and rare earth or two sorts or more are supported. There by the chelating agent The support approach to the monolith of the macromolecule chelate metal catalyst characterized by adding either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst elements which are obtained by carrying out the chelate bond of one sort of metals, and is obtained, and supporting a single metal or a compound metal.

[Claim 5] A chelating agent Polyacrylic acid, the poly allylamine, polymethacrylic acid, A polyvinyl

amine, the Pori (N and N-dicarboxy methyl) allylamine, Polyvinyl imidazole, polyvinyl peeler ZORU, polyacrylamide, Polyvinyl METOKISAZORIDON, the polyamide of ethylene-diamine-tetraacetic acid and ethylenediamine, 1, the acid anhydride of 2-cyclohexanediamine tetraacetic acid and 1, a polyamide with 2-diamino cyclohexane, The polyamide of 1 and 2-cyclohexanediamine tetraacetic acid and 1 and 2-diamino cyclohexane, 1, the polyamide of 2-cyclohexanediamine tetraacetic acid and ethylenediamine, The support approach of the macromolecule chelate metal catalyst according to claim 1 or 2 characterized by being any one sort of the copolymer of vinyl acetate and a methacrylic acid, and the copolymer of an itaconic acid and methacrylic acid, or two sorts or more.

[Claim 6] The catalyst metal to chelate is the support approach of the macromolecule chelate metal catalyst according to claim 1 to 5 characterized by being any one sort of platinum, a rhodium, iridium, a ruthenium, palladium, silver, gold, an osmium, and the rhenium, or two sorts or more.

[Claim 7] The porous body which is a detailed grain is the support approach of the giant-molecule chelate metal-barium catalyst according to claim 1 to 6 characterized by being any one sort of an alumina, a silica, a silica alumina, a zeolite, mordenite, a titania, Seria, and the zirconia, or two sorts or more.

[Claim 8] The barium compound used for support of barium among alkaline earth metals is the support approach of the macromolecule chelate metal catalyst according to claim 1 to 7 characterized by being any one sort of barium acetate, EDTA barium, CyDTA barium, a barium nitrate, tetra-nitroglycerine platinic acid barium, and chloroplatinic acid barium, or two sorts or more.

[Claim 9] The macromolecule chelate metal catalyst object acquired by the support approach of a macromolecule chelate metal catalyst according to claim 1 to 6.

---

[Translation done.]

## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the catalyst acquired among the catalysts for exhaust gas purification by the catalyst metal support approach of the catalyst for purification useful to especially the exhaust gas for automobiles, and its catalyst metal support approach.

#### [0002]

[Description of the Prior Art] The catalyst for exhaust gas purification characterized by the conventional catalyst for lean burn automobile exhaust purification consisting of the barium oxide, the lanthanum oxide, and platinum which the support which is a porous body, and the support concerned were made to support so that JP,5-261287,A may see is known.

[0003] How to make this catalyst was immersed, calcinated after desiccation the support which carried out the coat of the alumina to the mixed solution of the water solution of a dinitrodiammine platinum nitric-acid water solution, barium acetate, or a barium nitrate, and a lanthanum nitrate water solution, and was manufacturing it.

#### [0004]

[Problem(s) to be Solved by the Invention] However, the conventional catalyst for lean burn automobile exhaust purification was weak to thermal resistance, and the phenomenon in which carried out sintering (condensation) and the rate of exhaust gas purification, especially the amount of NOX occlusion fell had generated platinum under continuous hot environments.

[0005] About sintering of this platinum, this artificer etc. has advocated solving according to the catalyst which used polyvinyl-pyrrolidone (PVP is called.)-platinum / rhodium compound metal colloid.

[0006] However, when barium was supported for the catalyst using PVP-platinum / rhodium compound colloid and the amount of NOX occlusion was investigated, it turned out that the engine performance as prediction of the beginning [ amount / of NOX occlusion ] cannot be demonstrated.

[0007] As a result of examining in a detail where this cause is, it became clear that this invention person etc. had a problem in the gestalt at the time of a catalyst being supported. That is, it came to obtain the conclusion that a problem is in the dispersibility of barium at the time of supporting the barium which is an alkaline earth metal to catalyst support.

#### [0008]

[Means for Solving the Problem] Then, by this invention persons' controlling sintering of platinum by using compound metal colloid, such as a platinum rhodium alloy, and supporting barium to high distribution near the platinum The catalyst acquired by the catalyst metal support approach and the catalyst metal support approach of the catalyst for emission gas purification for automobiles which raised the dispersibility of the following barium as what acquires the catalyst for emission gas purification for automobiles which has the NOX occlusion ability superior to conventionally was developed.

[0009] And if the catalyst metal support approach concerning this invention is used, it will become possible not only compound metal colloid but to acquire the catalyst of a barium support mold usable as

an exhaust gas catalyst for automobiles, even if it is single metal colloid. In addition, a catalyst particle and a catalyst particle condense sintering here, and it means the coarse-grain-ized phenomenon. If a catalyst particle coarse-grain-izes, the fall of the catalytic-reaction interfacial area of a catalyst particle and exhaust gas will be caused, and a result to which the purification engine performance of exhaust gas is reduced will be brought.

[0010] Either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals by the chelating agent to claim 1, and is obtained is used. A single metal or a compound metal is supported to the porous body which is a detailed grain. Alkali metal, The water solution containing one sort of the compound of the element belonging to either alkaline earth metal and rare earth or two sorts or more is used. It considered as the support approach of the macromolecule chelate metal catalyst characterized by supporting one sort of the element belonging to either alkali metal, alkaline earth metal and rare earth, or two sorts or more.

[0011] It processes in the water solution which contains in claim 2 one sort of the compound of the element which belongs the porous body which is a detailed grain to either alkali metal, alkaline earth metal and rare earth, or two sorts or more. One sort of the element belonging to either alkali metal, alkaline earth metal and rare earth or two sorts or more are supported. By the chelating agent after that It is considering as the support approach of the macromolecule chelate metal catalyst characterized by supporting a single metal or a compound metal using either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst elements which are obtained by carrying out the chelate bond of one sort of metals, and is obtained.

[0012] The biggest description of these catalyst metal support approaches is in the point of performing support of the element ("elements, such as alkali metal," is called.) belonging to either alkali metal, alkaline earth metal and rare earth, and support with other catalyst elements as a separate process. An approach according to claim 1 supports a single metal or a compound metal to the porous body which is support first, and supports elements, such as alkali metal, after that to it. On the other hand, the sequence which supports elements, such as alkali metal, supports a single metal or compound metal colloid to the porous body whose approach according to claim 2 is support first, and supports it after that to it differs.

[0013] Thus, even if it put in and changed the sequence of elements, such as alkali metal, and a single metal or a compound metal to support, it became clear that it was changeless for the engine performance of the catalyst which is a final product in any way as a result of research. The high decentralization of elements, such as alkali metal made into the purpose, of this is attained by not supporting elements, such as alkali metal, to support and coincidence of a single metal or a compound metal like this invention as compared with the effectiveness of the conventional technique which is what performs support with elements, such as alkali metal, and a single metal or a compound metal to coincidence, but preparing the step of support processing of elements, such as alkali metal, separately.

[0014] The reaction procedure divided into three steps has invention according to claim 1. First step creates the single metal or compound metal colloid to which the chelate bond of the catalyst element was carried out by the chelating agent. That is, dissolution mixing of a chelating agent and the catalyst metallic compounds is carried out in a water solution, and alcohol, such as ethanol, is added, and after a predetermined time ring current, it filters and obtains by condensing until it becomes the target catalyst metal concentration.

[0015] It is desirable to use for a chelating agent here what was indicated to claim 5. Specifically Polyacrylic acid, the poly allylamine, polymethacrylic acid, A polyvinyl amine, the Pori (N and N-dicarboxy methyl) allylamine, Polyvinyl imidazole, polyvinyl peeler ZORU, polyacrylamide, Polyvinyl METOKISAZORIDON, the polyamide of ethylene-diamine-tetraacetic acid and ethylenediamine, 1, the acid anhydride of 2-cyclohexanediamine tetraacetic acid and 1, a polyamide with 2-diamino cyclohexane, The polyamide of 1 and 2-cyclohexanediamine tetraacetic acid and 1 and 2-diamino cyclohexane, Any one sort of the polyamide of 1 and 2-cyclohexanediamine tetraacetic acid and ethylenediamine, the copolymer of vinyl acetate and a methacrylic acid, and the copolymer of an itaconic acid and methacrylic acid or two sorts or more are used.

[0016] These chelating agents are easy to remove at the baking process after excelling in the chelation effectiveness and performing catalyst support, and it is very rare to affect the catalyst engine performance. Rather than anything, the chelating agent hung up here can distribute catalyst metal particles over high distribution. Without the particle diameter of the catalyst particle in the condition of having supported varying in the range which is 1 - 100nm of numbers, high distribution shall have the particle size distribution of about \*\*20% of mean particle diameter, and shall tell the above and the following that it is in the condition of having distributed to homogeneity on the occasion of support.

[0017] The need for distributing catalyst metal particles over high distribution serves as conditions searched for in case it is going to support elements, such as alkali metal supported as a separate process, to high distribution. That is, supposing it cannot make the chelated catalyst metal high-decentralize, support of elements, such as alkali metal performed after support of the catalyst metal concerned, cannot be high-decentralized, either. Moreover, if elements, such as alkali metal, are not supported with the case where elements, such as alkali metal, are supported first by high distribution so that it may indicate to claim 2 mentioned later, it is considered that it cannot make the chelated catalyst metal high-decentralize. By using the chelating agent stated above, it becomes possible to make the chelated catalyst metal high-decentralize.

[0018] And it is thought that there is especially no limit in the catalyst metal to chelate. In claim 6, the effectiveness of application of this invention has indicated as a clearly remarkable thing at the place of research of this artificer etc. the catalyst metal to chelate -- any one sort of platinum, a rhodium, iridium, a ruthenium, palladium, silver, gold, an osmium, and the rhenium -- or two or more sorts can be combined alternatively and can be used.

[0019] When combining two or more sorts alternatively and using them, the particle of at least one sort of catalyst metals covers the perimeter of other metal colloidal particles, becomes what plays a role of protective colloid, and can maintain the high catalyst engine performance over a long period of time. For example, if it is the combination of platinum and a rhodium, rhodium colloid will cover the front face of platinum colloid, and the role from which platinum colloid is protected will be played.

[0020] There are various things in the compound used as the source of supply of an above-mentioned catalyst metal. In the case of single catalyst metal colloid, it is sufficient if it is used [ suitably / for the purpose of the compound containing one sort of catalyst metals ] alternatively. Many kinds of optimal combination exists as it is desirable as a platinum compound to use dinitrodiammine platinum and it is desirable to use a nitric-acid rhodium as a rhodium compound, in order for a place to obtain for example, platinum-rhodium-alloy compound metal colloid.

[0021] The optimal combination should be defined in consideration of many properties whether the high catalyst engine performance is securable on the occasion of actual use in the ability to support [ whether it excels in the long term stability of the quality of colloid, and ] easily. Anyway, in consideration of affinity with the chelating agent to be used, the suitable compound containing an above-mentioned catalyst metal can be used alternatively suitably.

[0022] As the second step, the single metal colloid or compound metal colloid obtained by first step is supported to the porous body used as support. The alumina indicated to claim 7, a silica, a silica alumina, a zeolite, mordenite, a titania, Seria, and a zirconia can be used for a porous body here. It is useful to use an alumina, if an economical field is taken into consideration, and the alternative use doubled with the purpose of using a final catalyst, such as using mordenite with the width of face of selection if there is the need of taking the diameter of porosity into consideration, is possible.

[0023] The support approach is performed by carrying out predetermined time churning and carrying out adsorption support of the support of the specified quantity, and the metal colloid obtained by first step in a water solution. At this time, desiccation of 110 degree-Cx 2 hours may be performed for the purpose of more positive support of a catalyst metal, and baking processing of 450 degree-Cx 2 hours may be performed if needed. And support processing of elements, such as alkali metal, is performed as the third step.

[0024] Support processing of the predetermined time of the second step is completed, and support of elements, such as alkali metal of the third step, is performed by adding the compound which contains

elements, such as alkali metal, in the solution. If it adds as the shape of a solution and the compound which contains elements, such as alkali metal, at this time is agitated, it does not have maldistribution in a solution and homogeneity can be made to distribute it.

[0025] Especially barium is used for the emission-gas-purification catalyst of an automobile also in elements, such as alkali metal, and it is NOX. Since it is used for adsorption treatment, it is a very important element. The barium compounds suitable for using for support of this barium are barium acetate, EDTA barium, CyDTA barium, a barium nitrate, tetra-nitroglycerine platinic acid barium, and chloroplatinic acid barium, as indicated to claim 8. If these barium compounds are used in the support approach concerning this invention, it will become possible to make it support as a particle of barium with the degree of dispersion it is detailed and high distributed to homogeneity.

[0026] Then, evaporation to dryness of the moisture is carried out, desiccation processing is performed, it calcinates at predetermined temperature for several hours, and manufacture of a macromolecule chelate metal catalyst object according to claim 7 is completed. It becomes this macromolecule chelate metal catalyst has the high dispersibility of catalyst metals of others, such as alkali metal, and possible to maintain the NOX occlusion ability which does not have degradation of the catalyst engine performance and was excellent also in the bottom of a pile stop and hot environments in advance of sintering of a catalyst metal.

[0027] Unlike claim 1, invention according to claim 2 supports elements, such as alkali metal, first. Support of elements, such as alkali metal performed first, adds the porous body which is support in the water solution which dissolved the compound which contains elements, such as same alkali metal, with having used at the third step stated by explanation of the catalyst metal support approach of above-mentioned claim 1, it does not have maldistribution and homogeneity is made it to be carrying out predetermined time churning and to carry out distributed support. At this time, desiccation of 110 degree-Cx 2 hours may be performed for the purpose of more positive support of alkali metal etc., and baking processing of 600 degree-Cx 2 hours may be performed if needed.

[0028] Next, although single metal colloid or compound metal colloid is made, since it is the same in explanation of the first step of claim 1 having shown about this, the duplicate publication is omitted.

[0029] Then, in the water solution which dissolved elements, such as alkali metal, for this single metal colloid or compound metal colloid, predetermined time churning is continued further and support processing of a single metal or a compound metal is performed [ be / it / under / solution / which support of elements, such as alkali metal, completed / adding ].

[0030] Finally, evaporation to dryness of the moisture is carried out, desiccation processing is performed like invention according to claim 1, it calcinates at predetermined temperature for several hours, and manufacture of a macromolecule chelate metal catalyst object according to claim 9 is completed.

[0031] If this macromolecule chelate catalyst is used as an exhaust gas purification catalyst of an automobile as especially mentioned above, with the conventional catalyst, the stabilization occlusion of NOX which was not able to be obtained will become possible and it will become realizable [ the outstanding LEV automobile ].

[0032] The support approach of the catalyst described above is the approach of supporting a catalyst directly to a detailed grain, i.e., the porous body which is fine particles. Below, the coat of the front face of the monolith which is the component of a catalyst object is carried out by the porous body which is a detailed grain beforehand, and the support approach to the monolith of the macromolecule chelate metal catalyst which supports a catalyst metal to a porous body is explained after that. With the monolith, it uses for the above and the following as a concept containing all the members that constitute catalyst objects, such as the ingredient used [ for manufacture of winding-up catalysts, such as metal wave foil and metal spacer foil, and a square shape laminating catalyst ], the component of a ceramic honeycomb, and really fabricated ceramic honeycomb.

[0033] Invention explained below aims at improving adsorbent [ of the catalyst metal in the catalyst metal support at the time of supporting a catalyst metal ]. In case a catalyst metal is supported using PVP as catalyst metal colloid, generally it is difficult to once support compared with supporting directly to the porous body which is a detailed grain to the porous body which is the detailed grain which carried

out the coat to the monolith. When starting, the rate of adsorption at the time of making a catalyst metal adsorb gets remarkably bad.

[0034] Using the monolith which carried out the coat of the porous body which is a detailed grain as a means to solve this problem, by performing separately support of elements, such as alkali metal, and support of other metal catalyst elements, a rate of adsorption can be raised and the condition that elements, such as alkali metal, distributed minutely to homogeneity can be acquired. There are not the manufacture approach according to claim 1 or 2 fundamentally supported directly to the porous body which is a detailed grain, and a place which changes in any way. And the stable outstanding adsorption engine performance is securable by choosing a macromolecule chelating agent proper.

[0035] Are the approach of supporting a catalyst metal component, and the monolith which carried out the coat of the porous body to the monolith which carried out the coat of the porous body which is a detailed grain to claim 3 by the chelating agent The compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals, and is obtained is used. Support a single metal or a compound metal to a porous body, and one sort or two sorts or more of water solutions of the compound of an element which belong there at either alkali metal, alkaline earth metal and rare earth are added. It is considering as the support approach to the monolith of the macromolecule chelate metal catalyst characterized by making one sort of the element belonging to either alkali metal, alkaline earth metal and rare earth, or two sorts or more support.

[0036] The support approach according to claim 3 is the support approach which supports either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are first obtained by carrying out the chelate bond of one sort of metals by the chelating agent, and is obtained and supports elements, such as alkali metal, to the porous body which is the detailed grain which carried out the coat to the monolith continuously.

[0037] Here, the porous body which is a detailed grain is one sort of the alumina indicated to claim 7, a silica, a silica alumina, a zeolite, mordenite, a titania, Seria, and a zirconia, or two sorts or more. The porous body of a multiple-times repeat and the amount of the purposes carries out the coat of the process which it is immersed [ process ] and dries a monolith in the water solution with which the coat to the monolith of this porous body made the porous body suspend.

[0038] Each compound according to claim 5 can be used for a chelating agent as mentioned above. About the reason to which it was presupposed that these compounds are used, since it becomes the publication which is the same as that of the above-mentioned, and overlapped, it omits.

[0039] As for the catalyst metal used for the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals by the chelating agent, and is obtained, it is desirable any one sort or to combine two or more sorts alternatively and to use [ of the platinum indicated to claim 6, a rhodium, iridium, a ruthenium, palladium, silver, gold, an osmium, and a rhenium ] them. About how to combine, it is the same as that of the above-mentioned, and the duplicate explanation is omitted.

[0040] Among the compounds containing elements, such as alkali metal, it is desirable also about a barium compound to use a barium compound according to claim 8, and it is the same as that of the above-mentioned also about the reason for having adopted these.

[0041] It is the approach of supporting a catalyst metal component to the monolith which carried out the coat of the porous body which is a detailed grain to claim 4. One sort or two sorts or more of water solutions of the compound of an element which belong the monolith which carried out the coat of the porous body to either alkali metal, alkaline earth metal and rare earth are used. One sort of the element belonging to either alkali metal, alkaline earth metal and rare earth or two sorts or more are supported. There by the chelating agent It is considering as the support approach to the monolith of the macromolecule chelate metal catalyst characterized by adding either of the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst elements which are obtained by carrying out the chelate bond of one sort of metals, and is obtained, and supporting a single metal or a compound metal.

[0042] This support approach according to claim 4 is the support approach which supports either of the compound metal colloid which is made to support elements, such as alkali metal, first and carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals by the chelating agent to the porous body which is the detailed grain which carried out the coat to the monolith continuously, and is obtained.

[0043] About the compound containing elements, such as a catalyst metal used for the compound metal colloid which is made to carry out the chelate bond of the single metal colloid or two or more sorts of catalyst metals which are obtained by carrying out the chelate bond of one sort of metals, and is obtained here by the coat approach to the monolith of the porous body which is a detailed grain, and a porous body, the chelating agent, and the chelating agent, and alkali metal, since there are not invention according to claim 3 and a place which changes in any way the publication about the contents be omitted.

[0044] If the support approach of the above catalyst metal according to claim 3 or 4 is adopted, support in the condition that degree of dispersion of barium is high is possible, and even if it is a porous body in the condition of having carried out the coat to the monolith, the rate of adsorption to the porous body of the chelated catalyst element can be further carried out more early by using each compound according to claim 5 as a chelating agent. Consequently, adsorption time amount can be shortened and it can contribute to the productivity drive of a product.

[0045] In order to explain more nearly plainly claim 3 and an effect of the invention according to claim 4, the adsorption support rate of the platinum which is the catalyst metal of the case where the honeycomb which carried out the coat of the alumina to the platinum colloid which is single catalyst metal colloid which used polyacrylic acid (PAA is called hereafter.) for the chelating agent concerning this invention is immersed, and the case where a polyvinyl pyrrolidone (PVP is called hereafter.) is used is measured. The relation of the platinum concentration and adsorption (support) time amount which remained in platinum colloid is shown in drawing 1. The residual platinum concentration in the solution at this time measured and asked for the solution in ion plasma emission spectrochemical analysis.

[0046] As for the thing using PAA as a chelating agent, according to this drawing 1, compared with the case where PVP is used, it turns out that the amount of residual platinum is decreasing quickly with time, and the rate the platinum which is a catalyst element carries out [ a rate ] adsorption support becomes very quick compared with the case where PVP is used. if adsorbent and stability are taken into consideration -- the weight ratio (M/P) of a catalyst metal (M) and a chelating agent (P) -- the range of  $=1/4 - 1/0.2$  serves as best rate of adsorption. Also in this range, the range of heavy quantitative ratio (M/P)  $=1/3 - 1/1$  shows a rate of adsorption quick in peak. And not only a rate of adsorption but the outstanding dispersibility can be attained.

[0047] Thus, it becomes possible to also raise the dispersibility of elements, such as alkali metal collectively supported from the dispersibility of catalyst metals, such as platinum, being raised.

[0048]

[Embodiment of the Invention] Hereafter, the gestalt of the operation considered to be best [ about this invention ] is explained.

[0049] The 1st operation gestalt: Dissolution mixing of the 2g of the polyacrylic acid of 8.688g (platinum concentration 4.604%) of dinitrodiammine platinum and molecular weight 2000 was carried out first at 450ml water, 112.5ml ethanol was added, and it returned for 5 hours. Suction filtration of this was carried out, it was condensed, and it adjusted as polyacrylic acid-platinum colloid of 0.5623-% of the weight platinum.

[0050] Next, alumina 4g used as support was added into 40ml of polyacrylic acid-white gold colloid of the above-mentioned 0.5623-% of the weight platinum, and was agitated for 30 minutes, and platinum support was performed. Furthermore, 3.40g of barium acetate was added, it agitated for 16 hours, and barium was combined.

[0051] When association of barium was completed, evaporation to dryness was carried out, it calcinated on the conditions of 600 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. It became a catalyst with the presentation of result, 2g [ of platinum ], and barium 0.2mol,

and alumina (aluminum 2O3) 120g.

[0052] Make the mixed gas which contained NOX using this catalyst contact, gas occlusion is made to perform until it is saturated, and the occlusion of NOX and the check of emission are NO3- of FT-IR. It carried out by measuring the wave number of a peak, and the amount of occlusion measured the amount of emission NOX(s) in TG-DTA, and made it the amount of NOX occlusion. This approach is the same as that of the following. They were the amount 24.7 (mg/g) of NOX occlusion at this time, and 19.9% of barium utilization factors. The mixed gas said here is NO. 1000 ppm, O2 5%, N2 It has the presentation of balance. A barium utilization factor is a thing [ as opposed to / a thing / the amount of theoretical occlusion ] of the rate of the amount of observation occlusion.

[0053] The 2nd operation gestalt: Dissolution mixing of the 2g of the polyacrylic acid of 8.688g (platinum concentration 4.604%) of dinitrodiammine platinum and molecular weight 2000 was carried out first at 450ml water, 112.5ml ethanol was added, and it returned for 5 hours. Suction filtration of this was carried out, it was condensed, and it adjusted as polyacrylic acid-platinum colloid of 0.5623-% of the weight platinum.

[0054] Next, alumina 4g used as support was added into 40ml of polyacrylic acid-white gold colloid of the above-mentioned 0.5623-% of the weight platinum, and was agitated for 30 minutes, and platinum support was performed. Furthermore, 0.97g of potassium nitrates was added, it agitated for 16 hours, and the potassium was combined.

[0055] When association of a potassium was completed, evaporation to dryness was carried out, it calcinated on the conditions of 600 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. It became a catalyst with the presentation of result, 2g [ of platinum ], and potassium 0.2mol, and alumina (aluminum 2O3) 120g.

[0056] Make the mixed gas which contained NOX using this catalyst contact, gas occlusion is made to perform until it is saturated, and the occlusion of NOX and the check of emission are NO3- of FT-IR. It carried out by measuring the wave number of a peak, and the amount of occlusion measured the amount of emission NOX(s) in TG-DTA, and made it the amount of NOX occlusion. This approach is the same as that of the following. They were amount of NOX occlusion 25.3 mg/g at this time, and 20.0% of potassium utilization factors. The mixed gas said here is NO. 1000 ppm O2 5%, N2 It has the presentation of balance. A barium utilization factor is a thing [ as opposed to / a thing / the amount of theoretical occlusion ] of the rate of the amount of observation occlusion.

[0057] The 3rd operation gestalt: Dissolution mixing of 41.2844g (platinum concentration 4.578%) of dinitrodiammine platinum, nitric-acid rhodium (10.00% of rhodium concentration) 1.108g, and the 8g of the polyacrylic acid of molecular weight 32400 was carried out first at 2000ml water, 500ml ethanol was added, and it returned for 7 hours. This was condensed by suction filtration and it adjusted as the polyacrylic acid-platinum / rhodium compound metal colloid of 1.195-% of the weight platinum and a 0.069-% of the weight rhodium.

[0058] Next, alumina 12g used as support, and the polyacrylic acid-platinum / rhodium compound metal colloid 16.74g of the above-mentioned 1.195-% of the weight platinum and a 0.069-% of the weight rhodium were added into 80ml of water, it agitated for 30 minutes, and platinum-rhodium-alloy support was performed. Furthermore, the solution made to dissolve 5.11g of barium acetate in 40ml of water was added, it agitated for 16 hours, and barium was combined.

[0059] When association of barium was completed, evaporation to dryness was carried out with the rotary evaporator, it calcinated on the conditions of 600 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. It became a catalyst with the presentation of result, 1.8g [ of platinum ], and rhodium 0.2g, barium 0.2mol, and alumina (aluminum 2O3) 120g.

[0060] When the mixed gas which contained NOX using this catalyst is made to contact and NOX occlusion was made to perform, they were the amount 30.2 (mg/g) of NOX occlusion, and 24.4% of barium utilization factors. The publication which overlapped since it was the same as the first operation gestalt is abbreviated to the mixed gas and the barium utilization factor which are said here.

[0061] The 4th operation gestalt: Dissolution mixing of 41.2844g (platinum concentration 4.578%) of dinitrodiammine platinum, nitric-acid rhodium (10.00% of rhodium concentration) 1.108g, and the poly

allylamine 8g of molecular weight 50000 was carried out first at 2000ml water, 500ml ethanol was added, and it returned for 7 hours. Suction filtration of this was carried out, it was condensed, and it adjusted as the poly allylamine-platinum / rhodium compound metal colloid of 1.195-% of the weight platinum and a 0.069-% of the weight rhodium.

[0062] Next, the solution made to dissolve EDTA barium 6g in 40ml of water was added to alumina 12g used as support, and after carrying out churning adsorption for 1 hour, evaporation to dryness was carried out, and it dried on the conditions of 110 degree-Cx 2 hours, and calcinated on the conditions of 600 degree-Cx 2 hours. The poly allylamine-platinum / rhodium colloid 16.74g of the above-mentioned 1.195-% of the weight platinum and a 0.069-% of the weight rhodium were added to this into 80ml of water, it agitated for 30 minutes, and platinum-rhodium-alloy support was performed.

[0063] When support was completed, evaporation to dryness was carried out with the rotary evaporator, it calcinated on the conditions of 450 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. It became a catalyst with the presentation of result, 1.8g [ of platinum ], and rhodium 0.2g, barium 0.2mol, and alumina (aluminum 2O3) 120g.

[0064] When the mixed gas which contained NOX using this catalyst is made to contact and NOX-occlusion was made to perform, they were the amount 30.0 (mg/g) of NOX occlusion, and 25.0% of barium utilization factors. The publication which overlapped since it was the same as the first operation gestalt is abbreviated to the mixed gas and the barium utilization factor which are said here.

[0065] The 5th operation gestalt: It was immersed into the water solution which made the alumina suspend, and was made to dry at 110 degrees C for 2 hours, and the wave metal foil with the thickness of 50 micrometers first made with the stainless steel which is a monolith, a width of face [ of 5cm ], and a die length of 25cm, and the spacer foil were calcinated at 600 degrees C for 2 hours. Consequently, the coat was carried out to the front face of the wave metal foil and the spacer foil with the total 2g alumina. The wave metal foil and spacer foil which carried out the coat with this alumina were wound up in piles, and the catalyst object was formed.

[0066] And dissolution mixing of 41.2844g (platinum concentration 4.578%) of dinitrodiammine platinum, nitric-acid rhodium (10.00% of rhodium concentration) 1.108g, and the poly allylamine 8g of molecular weight 50000 was carried out at 2000ml water, 500ml ethanol was added, and it returned for 7 hours. Suction filtration of this was carried out, it was condensed, and it adjusted as the poly allylamine-platinum / rhodium compound metal colloid of 1.195-% of the weight platinum and a 0.069-% of the weight rhodium.

[0067] Next, it was immersed for 4 hours into the solution which diluted the catalyst object (honeycomb) which wound up in piles the wave metal foil which carried out the coat with this alumina, and the spacer foil until it became the platinum concentration of 350 ppm about above-mentioned poly allylamine-platinum / rhodium compound metal colloid. When support was completed, evaporation to dryness was carried out and it calcinated on the conditions of 450 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours. While being immersed in the colloidal solution, churning is continued and the solution was made for the maldistribution of a catalyst metal not to take place.

[0068] Then, the honeycomb was put in into the solution made to dissolve EDTA barium 6g in 40ml of water, after carrying out churning adsorption for 1 hour, evaporation to dryness was carried out, and it dried on the conditions of 110 degree-Cx 2 hours, and calcinated on the conditions of 600 degree-Cx 2 hours, and barium was supported.

[0069] When the mixed gas which contained NOX using this catalyst is made to contact and NOX-occlusion was made to perform, they were amount of NOX occlusion 30.2 mg/g, and 25.2% of barium utilization factors. The publication which overlapped since it was the same as the first operation gestalt is abbreviated to the mixed gas and the barium utilization factor which are said here.

[0070] Comparison sample 1: Here, as a comparison sample with the above-mentioned 1st operation gestalt and the 2nd operation gestalt, dissolution mixing of the 8.688g (platinum concentration 4.604%) of the dinitrodiammine platinum was carried out at 450ml water, alumina 12.0g used as support was added, it agitated for 30 minutes and adsorption support was carried out. And this was separated and rinsed, it calcinated on the conditions of 450 degree-Cx 2 hours after desiccation of 110 degree-Cx 2

hours, and the platinum-alumina catalyst was adjusted.

[0071] Next, what dissolved 1.7g barium acetate in 20ml of water was added to 9.15g of this platinum-alumina catalyst, it agitated to it for 16 hours, and barium was combined with it.

[0072] When association of barium was completed, evaporation to dryness was carried out with the rotary evaporator, it calcinated on the conditions of 600 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. The catalyst with the presentation of result, 2g [ of platinum ], and barium 0.2mol and alumina (aluminum 2O3) 120g was acquired. This was made into the comparison sample 1.

[0073] When the mixed gas which contained NOX using this comparison sample 1 is made to contact and NOX occlusion was made to perform, they were the amount 18.5 (mg/g) of NOX occlusion, and 14.9% of barium utilization factors. The publication which overlapped since it was the same as the first operation gestalt is abbreviated to the mixed gas said here. The comparison result using this comparison sample 1 is indicated to Table 1.

[0074]

[Table 1]

使用触媒	NO <sub>x</sub> 吸蔵量 (mg/g)	バリウム等利用率(%)
第1実施形態	24.7	21.6
第2実施形態	25.3	20.0
比較試料1	18.5	14.9

[0075] Comparison sample 2: As a comparison sample after the 3rd operation gestalt, dissolution mixing of 41.2844g [ of dinitrodiimine platinum ] (platinum concentration 4.578%) and nitric-acid rhodium (10.00% of rhodium concentration) 1.108g and the polyvinyl-pyrrolidone 8g of molecular weight 25000 was carried out, and alumina 12g which is support was added, and it agitated for 30 minutes further, and calcinated after adsorption support for 450 degree-Cx 2 hours.

[0076] 5.11g of barium acetate was added after baking, it agitated for 16 hours, and barium was combined. When association of barium was completed, evaporation to dryness was carried out with the rotary evaporator, it calcinated on the conditions of 600 degree-Cx 2 hours after desiccation of 110 degree-Cx 2 hours, and the catalyst was adjusted. The catalyst with the presentation of result, 1.8g [ of platinum ], and rhodium 0.2g, barium 0.2mol, and alumina (aluminum 2O3) 120g was acquired. This was made into the comparison sample 2.

[0077] When the mixed gas which contained NOX using this comparison sample 2 is made to contact and NOX occlusion was made to perform, they were amount of NOX occlusion 27.7 mg/g, and 22.4% of barium utilization factors. The publication which overlapped since it was the same as the first operation gestalt is abbreviated to the mixed gas and the barium utilization factor which are said here.

[0078] To Table 1, the engine performance of the catalyst acquired with the above operation gestalt and the engine performance of a catalyst made into the comparison sample were compared and carried.

[0079]

[Table 2]

使用触媒	NO <sub>x</sub> 吸蔵量 (mg/g)	バリウム利用率(%)
第3実施形態	30.2	24.4
第4実施形態	30.0	25.0
第5実施形態	30.2	25.2
比較試料2	27.7	22.4

[0080] As shown in Table 1 and 2, when the comparison sample 1 and the comparison sample 2 are contrasted with the operation gestalt which can be compared, respectively, the amount of NOX occlusion and barium utilization factor of a catalyst which are applied to the operation gestalt of this

invention in any case serve as a value which was very excellent.

[0081]

[Effect of the Invention] It becomes the giant-molecule chelate metal-barium catalyst concerning this invention has high degree of dispersion of barium, and possible to maintain the outstanding catalyst engine performance. If this giant-molecule chelate metal-barium catalyst is used as an exhaust gas purification catalyst of an automobile, compared with the conventional catalyst, the stabilization occlusion of NOX will become possible and it will become realizable [ the LEV automobile using an internal combustion engine ].

---

[Translation done.]